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ABSTRACT

The Council of Great Lakes Governors and GTE North, Inc. developed a partnership titled "Pioneering Partners for Educational Technology" to disseminate innovative educational technologies developed by classroom teachers in eight states of the Great Lakes region. To accomplish this, Pioneering Partners provides a Partnership Summer Summit at which participants' skills in disseminating innovative educational technologies are developed. Evaluation of the initiative focused on providing the Council of Great Lakes Governors and GTE with information regarding the effectiveness of steps taken to spread the use of educational technology. Also, Pioneering Partners seeks to inform policy makers on decisions they face, in order to increase the likelihood that laws favoring technology in schools will be legislated. Most frequently disseminated technologies involved classroom computers; telecommunications technologies; computer labs; and video, laptop, and calculator technologies. The greatest factor in facilitating dissemination was Pioneering Partners materials and support, and the belief that something of value could be done. Rural educators especially indicated that lack of financial resources and technology know-how were the greatest inhibitions to dissemination efforts. Evaluation also assessed the highest level of technology use at adopting sites, and the initiative's influence on local and state education policy. Recommendations include developing a strategy to close the resource gap for rural schools, encouraging quality applications of technology to math and science instruction, using telecommunications as a reporting and evaluation tool, requiring clearly defined goals for student learning, providing scholarly literature to validate educators' experiences in the project and to promote a common language, and providing more support to ensure that dissemination achieves the lasting effect of technology adoption. An appendix contains eight figures. (TD)

Educational Technology Dissemination: Its Impact on Learning, Instruction, and Educational Policy

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Pioneering Partners—Origins and Mission

When the Council of Great Lakes Governors began talks in the fall of 1991 about developing a partnership with GTE North, Inc., that would accelerate the use of technology in K-12 classrooms, the Pioneering Partners Era Began. The initiative that resulted from those talks, formally titled *Pioneering Partners for Educational Technology*, has as its goal the dissemination of innovative educational technologies developed for schools by schools. The initiative not only recognizes "best practices" in educational technology, but also seeks to build participants' skills in disseminating those technologies. To accomplish this, Pioneering Partners provides development opportunities at a Partnership Summer Summit, coalition building opportunities, dissemination skills training, connection to Greatlinks Net/Internet, and financial support to defray dissemination costs.

In March 1992 the first Pioneering Partners applications were distributed with a cover letter from each state's governor to schools throughout the Great Lakes region. To evaluate the applications, the governors appointed a 16-member Advisory Council. Well over 100 applications were received, and from these the Council selected 24 teams to participate in the first year of the program. The 24 teams—three teams from each state—represented each of the eight Great Lakes Collaborative states: Illinois, Indiana, Michigan, Minnesota, New York, Pennsylvania, Ohio, and Wisconsin. For each of the last four years, Pioneering Partners has funded 24 educational technology dissemination teams in the Great Lakes region.

Educational technology projects submitted to Pioneering Partners by educators employ a wide selection of technologies: computer laboratories engage students in instruction on subjects ranging from phonics to geography; an array of telecommunications technologies, including two-way audio/visual fiber optic and copper cable, facsimile, satellite, and cellular and video telephones, allows students to communicate with peers, legislators, and sources sometimes thousands of miles away; local area networks (LAN's) are established to broaden technology access; laptop computers and calculators are used to employ unique learning strategies; and scanners and high resolution monitors are used to produce "electronic art," which eventually finds its way into video production.

Winning educator teams are encouraged to share these innovations so other educators can replicate them. The primary beneficiary of these endeavors is intended to be the students, who should find learning in a technology-oriented educational system much more meaningful. Secondary benefactors are the educators—who now engage their students at a higher level of thinking and prepare themselves to access a greater assortment of information—and the communities in which the schools reside. These communities also find their students more prepared to enter a technology-oriented workforce.

Evaluation Overview

The major purpose of the evaluation of the technology dissemination initiative is to provide the Council of Great Lakes Governors and GTE with timely information regarding the effectiveness of steps taken to spread and improve the use of educational technology through the Pioneering Partners initiative. Efforts are made to understand the dissemination process and outcomes among Pioneering Partners regionwide. The evaluation also assesses initial and longitudinal experiences of participants at the Leadership Summer Summit.

The primary goal of the evaluation is to distinguish the outcomes of dissemination. Two measurable indicators of dissemination are its breadth and degree of manageability. The evaluation therefore seeks to understand how the transfer of educational technology innovations occurs and the scope of effort involved. Also of interest are the barriers to dissemination, how they affect the goal of implementation, and how they are overcome. To address these issues and others, the following questions guide the evaluation:

1. What are the intended outcomes of the Pioneering Partners initiative and what criteria exist to determine if they were achieved?

2. What key events, processes, and attributes describe the implementation of the Pioneering Partners technology initiative?

3. What processes/supports do participating schools and other stakeholders feel are essential to the optimal dissemination of innovative programs and technologies in their region? What role does the Leadership Summit play in providing and sustaining these strategies and supports?

4. In what specific ways are schools participating in the Pioneering Partners initiative employing their financial awards?

5. Does the Pioneering Partners initiative provide an adequate mechanism to ensure that innovative models of educational technology become standard practice in multiple classrooms?

6. How willing are schools to adopt technological innovations? What are their motivations? How does adoption improve educational technology integration and implementation?

7. What policies, systems, and procedures need to be refined and/or established in order to maximize program implementation and technology use in the schools?

8. What is the range of the dissemination process and how far beyond initial contact does effect follow?

9. What common criteria do selected schools share, and can a common core of features identify schools likely to benefit from or excel in the Pioneering Partners program?

In addition to assessing the impact, process, and quality of dissemination, a smaller, although significant, focus for the evaluation is the local, regional, and statewide policies facilitating the dissemination of educational technologies. Implementing technology requires systemic thought of educational delivery, and as much as Pioneering Partners can inform the decisions policymakers face, the more likely that laws favoring technology presence and use in the schools will be legislated. Specifically, the evaluation seeks to determine if Pioneering Partners puts educators in a position to have a voice in the policymaking processes, and in what ways and at what levels partners are affecting policy in their communities and states.

Methods

To respond to the range of questions this evaluation presents and to be sensitive to unintended effects emerging from the program, both qualitative and quantitative methods were used to gather data. *Document analysis* was a key strategy that allowed evaluators to review school technology and application plans. *Interviews* with key stakeholders were necessary to understand the micro and macro structures that support fulfillment of the Pioneering Partners program. Interviews were conducted with individuals executing a number of roles including students, teachers, parents, building and district level administrators, library media and technology specialists, school board members, governors office personnel, state legislators, Pioneering Partners advisory board members, and higher education faculty. *Focus groups* were a cost-effective strategy for convening small groups of people to address evaluation questions. Groups were assembled according to natural affiliations so the dialogue followed relevant paths for all participants. *Observation of key events* were used to evaluate the range and effects of technology use. Classroom events were the primary targets of observation allowing evaluation team members to see student use of the technology innovations, the products being disseminated, and the dissemination outcomes.

The methods identified above were used within the structure of case study evaluation. The intent for the use of the case study as a data collection method lies in its ability to examine complex issues and relationships within the context the study's exist. Rationale for case study methodology can be found in the writings of Bogdan and Biklen (1982), Miles and Huberman (1984), Williams (1986), and Patton (1990). While presenting slightly varying approaches to case study methods, these authors agree that interpretive accounts facilitated through observation, interview, and document analysis comprise the case study, which are the approaches these case studies employed.

A participant questionnaire provided a broad view of the Pioneering Partner experience. The questionnaire was a method designed for achieving broad feedback from Partners, while the aim of the case studies was to provide more depth into dissemination inquiry. (Cronbach, 1982). The questionnaire (see Appendix A) was constructed to solicit descriptive, process, and outcomes information from respondents. Descriptive information provided facts on the partners' roles within the educational systems, the type of technology they were disseminating, and the curriculum areas and grade levels targeted. Process inquiry borrowed from the research of Ely (1990) and Hall et al. (1975). Ely's *Conditions Facilitating the Implementation of Educational Technology Innovations* provided the questionnaire with validated guidelines for successful technology implementation. Respondents indicated on a three-point scale the conditions that were present to prompt the implementation of the educational technology at their schools. Respondents also indicated the conditions that were present for implementation at adopting locations. Hall et al.'s *Framework for Analyzing Innovation Adoption* supplied a standardized archetype for determining levels of educational technology use. This framework, with levels ranging from a lack of knowing that the innovation exists to an active and highly effective use of it, gathered feedback on educational technology use achieved by adopting locations. Hall et al.'s *Levels of Use* (LoU) operationally defines various states of innovation user behavior so that adopting locations' use of the technology can be ascertained. Outcomes information identified the breadth of impact in terms of numbers of students, teachers, and schools participating.

Analysis of data was first done to determine aggregate outcomes. When it was determined that data might show interesting results when stratified by characteristics of location (urban, rural, suburban) and year funded (1992, 1993, 1994), analysis continued. Statistical tests, including independent T-tests for means and independent Z-tests for percentages, were conducted at the 95 percent level of significance, a point at which evaluators were willing to conclude that significant values were atypical and not due to chance error. Unfortunately, space and time prohibit the discussion of the entire results of the evaluation. The remainder of this paper relates a portion of the survey results for rural schools involved in the evaluation.

A Profile of Dissemination in Rural Settings

Although Pioneering Partners is not exclusive to rural settings, its largest group of funded sites to represent rural areas (42%). In describing dissemination in rural settings (see Appendix, figure 1), the largest fraction of dissemination efforts target students in grades 6 through 8 (41%). However, other grade levels (K-5 39%; and high school 38%) are also well represented as dissemination targets.

When content areas of dissemination are analyzed, math (55.6%), science (55.6%), and English (50.5%) are the most frequently disseminated. Music (11.1%) is a least

disseminated subject area (see figure 2). When analyzed from year to year, there is a wide fluctuation in the number of subjects funded. However, several subjects show significant net decreases in funding over the three years. For instance, 62 percent of the projects in 1992 were math related, but in 1993 only 55 percent were math related, and in 1994 the figure dropped to 43 percent. These figures represent a 19 percent net decrease in the amount of math-related projects funded over the course of the three years. Science-related projects dropped 23 percent from 1992 to 1993, but rose 10 percent again in 1994, a net decrease, however, of 13 percent. Funded art projects show a net decrease of 17 percent; social studies projects, a net decrease of 5 percent; and music projects, a net decrease of 6 percent. Subject areas showing increases in funding are English (6%) and vocation-related initiatives (3%). More detailed analysis of content area application is confounded by the number of technology initiatives disseminating integrated programs.

The type of technology (see figure 3) most frequently disseminated was classroom computers (77.6%), or applications for classroom computers. Telecommunications technologies (50%), including Internet use, electronic mail, cellular telephone and facsimile transmission, and interactive two-way audio/videoconferencing are a close second, followed by computer labs (46.6%). Over the three-year administration of the Pioneering Partners program, the data show a drastic decline in the funded projects employing video production (13%) and laptop/calculator (19%) technologies. A smaller decline (7%) is shown in the construction of local area networks. Holding steady is dissemination of applications for classroom computers. The dissemination of telecommunications technologies (16%) have been of increasing interest for Pioneering Partners.

Inhibiting and Facilitating Factors in Dissemination

When asked what factors inhibited or facilitated dissemination, respondents indicated that Pioneering Partners' materials and support, and believing they could do something of value were the greatest facilitators of their dissemination efforts. Other factors such as administrative and collaborative support, peer support, and understanding of dissemination technologies also rate high as facilitators (see figure 4). Predictably, educators in rural areas were significantly more likely than their urban and suburban counterparts to indicate that the lack of financial resources inhibited their dissemination efforts. Similarly, rural educators are likely to indicate that it is their lack of technology know-how that also inhibits dissemination.

Conditions Prompting Implementation of the Technology

When identifying what conditions were present in generating the interest and implementation of educational technologies for themselves and adopting locations, dissatisfaction with the status quo (2.7 out of a 3.0 possible mean score) heads the list (see figure 5). The presence

of leadership and continuing support (2.6) and commitment of key implementors (2.5) were also major conditions responsible for initiating change. Rewards and incentives (1.6) and being forced to participate (1.1) are the conditions least present for initiating change. Adopting locations seem to share the same conditions as disseminating locations for interest in the implementation of educational technologies. However, disseminators believe that adopting locations are more driven with people available with key knowledge and skills, although also believing that adopting locations are now more driven by available rewards (1.9) and incentives and force (1.2).

Ascertaining Levels of Use

One of the survey questions asks respondents to indicate the highest level of technology use their adopting locations have achieved. These levels, identified by Hall et al., are hierarchically listed and defined so that adopting locations will have achieved one or more of the levels (see figure 6). The majority of adopting locations appear to have achieved a routine pattern of use (29.4%) A significant number of adopting locations are still taking action to learn more detailed information about the technology (15.1%). Smaller proportions of the adopting locations are collaborating to adapt the technology to more individual needs (11.4%), exploring alternatives for it's use (8.8%), or, evaluating the technology (7.3%).

An additional inquiry into the level of educational activity at adopting locations asks the Pioneering Partners to rate the degree of activity of each category of technology use identified by Hall et. al. using a 1 equals not active, 2 equals somewhat active, 3 equals moderately active, and 4 equals very active scale (see figure 7). While respondents indicated that the adopting locations with which they work have engaged quite robustly in all levels of activity, they are most active in discussing outcomes of the technology adoption process (3.02), and seeking new information about the technology (2.93); while being least active in the technology's assessment (2.60).

Rural Pioneering Partners' total time spent on various activities of dissemination is apportioned as such: most of the time is spent on planning (20.3%) and awareness (19.6%) activities, while the least amount of time is spent on evaluation (9%, see figure 8). If these activities, like Hall et al.'s levels of technology use, are intended to be linear—so that obtaining funding generally preceded awareness, following in order by planning, evaluation, consulting, and finally adoption—then here, too, an interesting inverse of results is shown. Data from Partners funded in 1994 show that a greater proportion of them have achieved actual adoption (19.7%) than have 1992 (18.2%) and 1993 (8.1%) Partners. Although it might be the case that the activities of dissemination occur more concurrently than linearly, the level of adoption achieved by 1994 does present an aberration.

Methodological Concerns—The Efficacy of Hall et. al's Framework for Analyzing Technology Innovation Adoption

While Hall's et. al.s seminal framework for analyzing innovation adoption has long been held as one of the most reliable sources for studying the adoption of educational innovations by, it appears to encounter certain limitations when it is used to analyze educational technology innovations. For example, when a longitudinal look is given to the levels of educational technology use adopting locations have achieved over the course of the three years of Pioneering Partners' implementation, surprising results emerge. While one would suspect greater levels of use would be achieved as the variable of time increases, the inverse is true in several cases according to Pioneering Partners data. The 1994 partners indicate that the adopting locations with which they are working are most active in learning about the technology and are determined to use it. They also report that the same locations are achieving equal or greater levels of technology use than their 1992 and 1993 cohorts in collaborating to adapt the technology to meet individual needs and in exploring alternatives to broaden the technologies use, the most advanced stages of Hall's levels of use of the innovation.

Several explanations are possible for this event. One could be the unique ability of adopting locations to collaborate and explore. Another explanation could lie in the ability of 1994 adopting locations to achieve technology institutionalization. A third explanation could speak to the quality of the training 1994 Pioneering Partners received. A reasonable explanation, however, deals not with the inherent qualities of the adopting locations of disseminators of the technology, but, with the ability of the Hall framework to explain technology innovations adoption. While the Hall et al. list "exploring alternatives to or major modifications of the innovation" as a culminating level of use, technology users at Pioneering Partners sites appear to be making major modifications to the technology to customize it to their own use almost at will. It seems that a re-ordering of Halls Levels of Use (LoU) of the innovation are necessary when considering the adoption of educational technologies, especially in light of the fact that technology disseminators define technology institutionalization as the point at which adoption achieves a routine pattern of use.

Though it is not the intent of this paper to propose a model for analyzing innovation adaption, the experience does show that Hall's framework is necessary, but not sufficient for understanding the adoption of educational technologies. Given the ease at which technologies can be modified and subsequently pilot tested, exploring alternatives for modification might well belong at front of the Levels of Use scale than at the end of it, at which point establishing routine use takes a place at the end of the scale. Finally, a more reciprocal than linear model might better explain the adoption of technological innovations.

Effects on Education Policy

Educator teams report that they have been fairly influential in contributing to policy decisions related to educational technology. The influence is largely more local than statewide. The impact on statewide policy should not be negated, however. Interviews with policymakers and advisors unequivocally show that significant effects on state level educational policy can be directly traced to the influence of Pioneering Partners. And while impacts at a larger level are infrequent, scope and duration of impact more than compensate.

Implications for policy are three-fold. First, because collaboration has become a hallmark of the Pioneering Partners process, it serves local needs and specific interests well. This means that influence on policy appears to be in the places where it's most important in local schools and communities.

Second, it is likely true, as one informant to this study said, that many legislators listen to people with lots of money to spend and to people with large blocks of voting power. Affecting policy then means that a more grassroots effort is necessary. When students, parents, teachers, and community members share their experiences of how learning and the quality of teaching in the classroom has improved, the more likely the support for favorable educational technology legislation.

Finally, a smaller body of policy and advisors exists, who are unfamiliar with the positive impacts of educational technology on teaching and learning, and more specifically the influence of Pioneering Partners on policy considerations. The more these skeptics know about the program the less of a barrier they become to school change.

Conclusion

Across all data sources, considerable evidence exists to show that the Pioneering Partners program is achieving its primary goals. By recognizing the most innovative teachers using technology in the classroom, Pioneer Partners has empowered them to join and build coalitions with a large number of stakeholders to effect systemic educational reform. The opportunities for preparation that Pioneering Partners has provided these educators are largely responsible for the reform they're initiating.

And the process of dissemination itself is broad and far-reaching. Not only is there more educational technology, but more time is being spent with the technology. Not only are there more teachers employing educational technologies in the classroom as a result of the project, but the sophistication of these technologies is at a higher level than it has even been before. While other efforts have focused on the development of educational technologies themselves, Pioneering Partners has concentrated its energy on deploying these technologies so that they

quickly find and serve their intended audiences. This accessibility to educational technologies has answered the call for educational change made by educators, scholars, parents, and community leaders.

Besides meeting the goal of disseminating educational technologies throughout the Great Lakes area, Pioneering Partners appears to have cultivated a relationship with its educator teams that serves both quite well. Without exception, participating teams indicated that Pioneering Partners were instrumental in helping them achieve dissemination results. Pioneering Partners also report that they continue to maintain relationships with well over 95 percent of the funded teams of the last three years. This relationship presents a successful collaboration model from which business and education can learn.

After three years of program implementation, Pioneering Partners also appears to have achieved a balance in technical training that matches the instructional needs of educator teams. This balance gives participants the confidence they need to achieve dissemination results. Clearly, Pioneering Partners' support has been more than providing participants with the proverbial fish so that they have one day's meal. Rather, it has been a lesson in fishing, so that the capacity for dissemination lasts a lifetime.

This evaluation poses several recommendations to broaden Pioneering Partners' potential and raises some issues requiring further consideration. These recommendations speak to some of the more distinctive findings within the data.

- A needful strategy is necessary for recognizing the resource constraints of rural schools and collaborating with them to close the resources gap. The importance of resources is apparent in the ratings rural respondents give the support provided by Pioneering Partners. In almost every case—technical support, financial support, materials, resources, recognition, etc.—rural partners provide the highest ratings of usefulness. For rural educators, continued resources are a necessary companion to the motivation and drive they display towards achieving dissemination results.

- With the increasing importance the nation's parents, teachers, industry leaders, and scholars are placing on math and science instruction, the evaluation recommends that Partnerships work to turn the tide of declining projects in these two areas by encouraging quality applications, and eventually funding projects that would respond to math and science priorities.

- Evaluation data demonstrate that educators are showing rapidly increasing interest in educational telecommunications technologies. While Pioneering Partners have used telecommunications to support educators teams, the evaluation recommends that

telecommunications also be considered as a reporting and evaluation tool for partners. Additionally, while telecommunications technology should be encouraged as a tool by which quality instruction is delivered, it should also be explored as a medium for dissemination instruction and educational activities.

- To encourage local, regional, state, and national policy facilitating the use of educational technologies in the classroom, a grassroots push that involves the entire constituency affected by the technology's use: students, teachers, parents, and community members works best. Likewise, the smaller the number of legislators and policy advisors who have yet to learn about the potential Pioneering Partners has for influencing educational technology policy, the less of a barrier they present for future legislation supporting the use educational technologies in the classroom.

- An analysis of a sample of the Pioneering Partners applications reveals that most are absent of clear, defined goals for student learning. While most applications identified what the students would or would not gain from the experience, these defining brush strokes were broad and ambiguous. Statements like "the program is designed to improve student writing in all curricular areas" and "our first desired outcomes is [sic] to have students write and publish a book," characterized learning goals. When applications list what outcomes they've observed and/or expect from their project, educator teams frequently list "cooperative learning" or "problem solving." Such general language lacks the clarity necessary to determine exactly what the students will be able to do after their learning experience using the technology. In instances where outcomes in student learning fail to drive, but rather, are driven by technology use, then students are no longer at the point of our combined effort to improve education. If learning objectives are more specific, and if the evidence is articulated which educators are willing to accept to determine if goals have been reached, then educator teams then have a framework for self-evaluation.

- Dissemination requires a common language. However, little communication exists between educator teams who win Pioneering Partners awards for their "best practices" and cognitive research in these areas. Many individuals who were interviewed in the case studies believed that having students involved in real-world experiences and in using students to gather authentic data for learning experiences produces more meaningful learning. Educator teams arrive at these points of view though intuition and years of experience. However, scholarly literature on cognitive learning, which is based on the experience of practice and research, provides readily accessible information to those without the luxury of experience. When educators access this information, they find cognitive research language that helps them validate what they are learning and gives them all a common language such as authentic task, student as leader, etc., to talk to each other with. This knowledge also builds bridges between

the teacher, research, and policymaker. The result would be that policymakers would have both the experience of teachers and research to impact decisions.

- Data on educational technology use in the classroom show substantial increases due to Pioneering Partners impact. In many instances, however, use declines after key dissemination and implementation role players leave. The implication is, where educational technology implementation and resulting dissemination involve major paradigm shifts for teachers, efforts are likely to curtail unless there is more support for teachers. This support has to come from schools, or other agencies or businesses to allow educator teams sufficient time to make sure that dissemination achieves a lasting effect of technology adoption.

- Dissemination efforts have been criticized by some observers as less than systemic. Many educator teams have failed to enlarge their influence directly in their own schools and across multiple grade levels and content areas. This effect is clearly a result of the shortage of resources. However, it presents an interesting issue for Pioneering Partners to address: Should the program focus on building teachers as change agents, or should Pioneering Partners be looking to empower teams of teachers so that the effect is broader? Currently, Pioneering Partners encourage and support the team concept. But, Partners leave the Summit do little to spread the team concept during dissemination. Team members become burdened as the work of dissemination grows, quality teachers are away from the classroom with greater frequency. Here, then, is a rationale for providing training and resources to empower educator teams to develop new team members with capacities and abilities in educational technology use and dissemination equal to their own.

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Appendix

Grades Worked to Disseminate to (N=64)

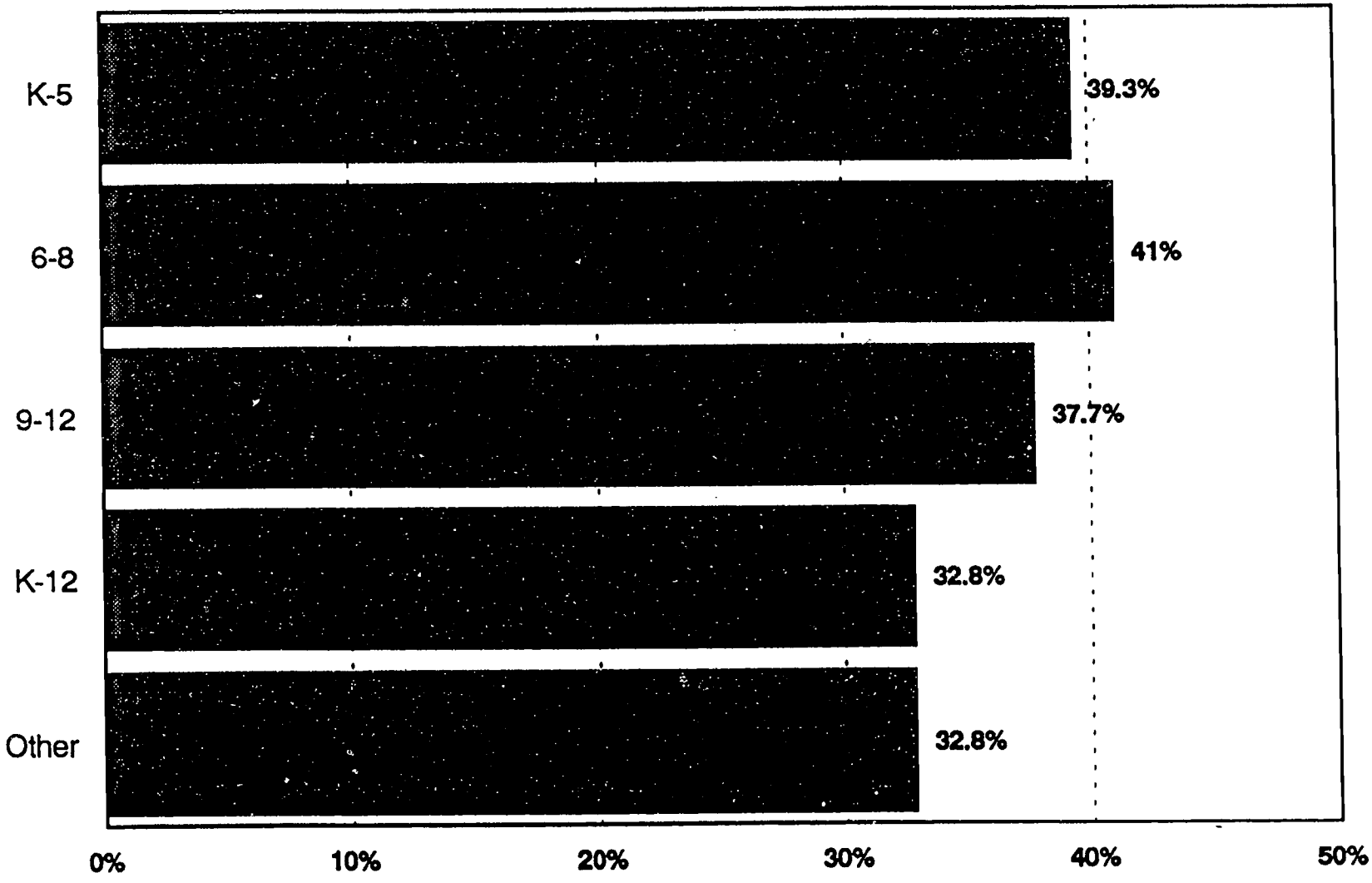

Figure 1

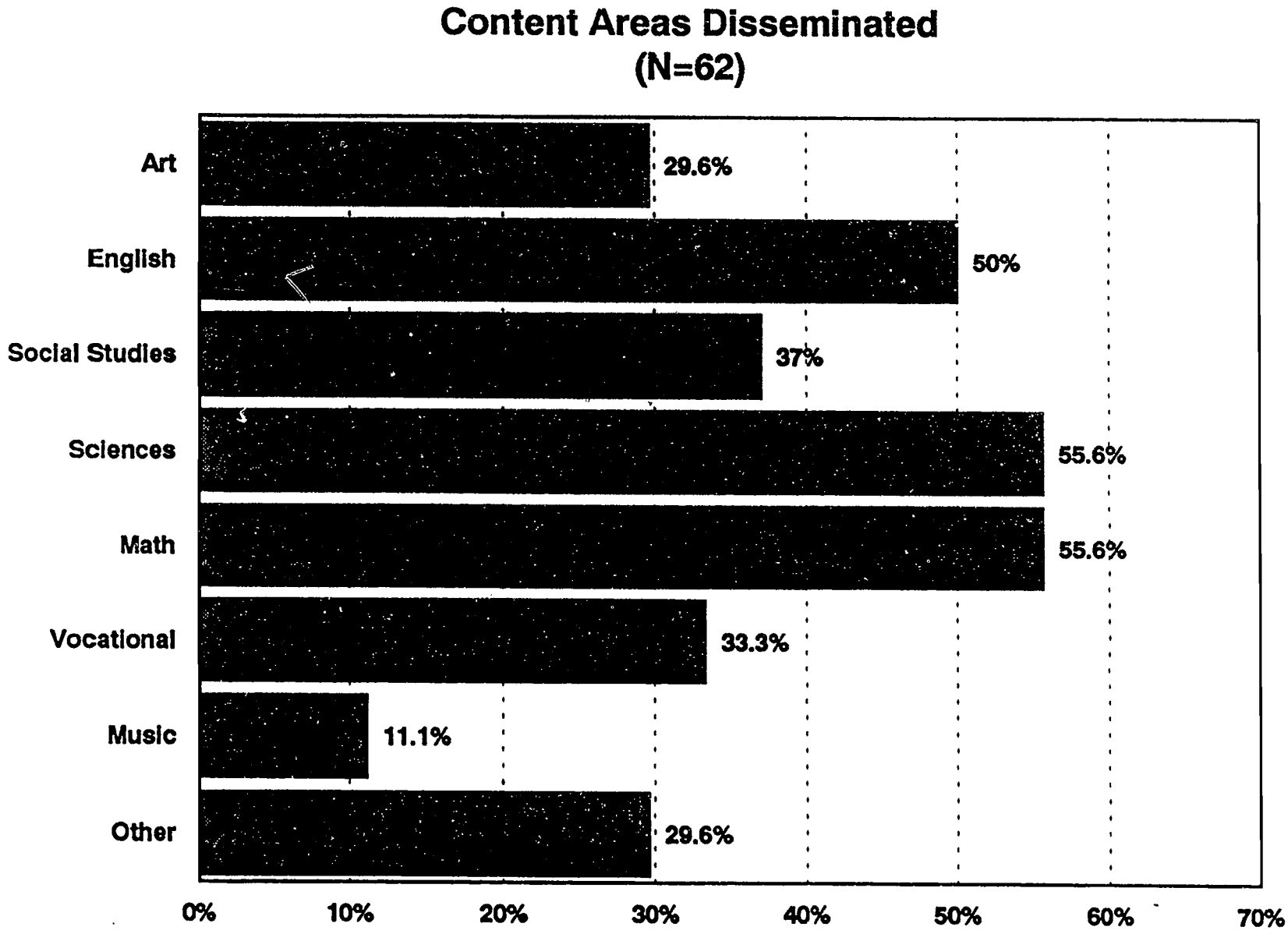

Figure 2

Technology Worked To Disseminate

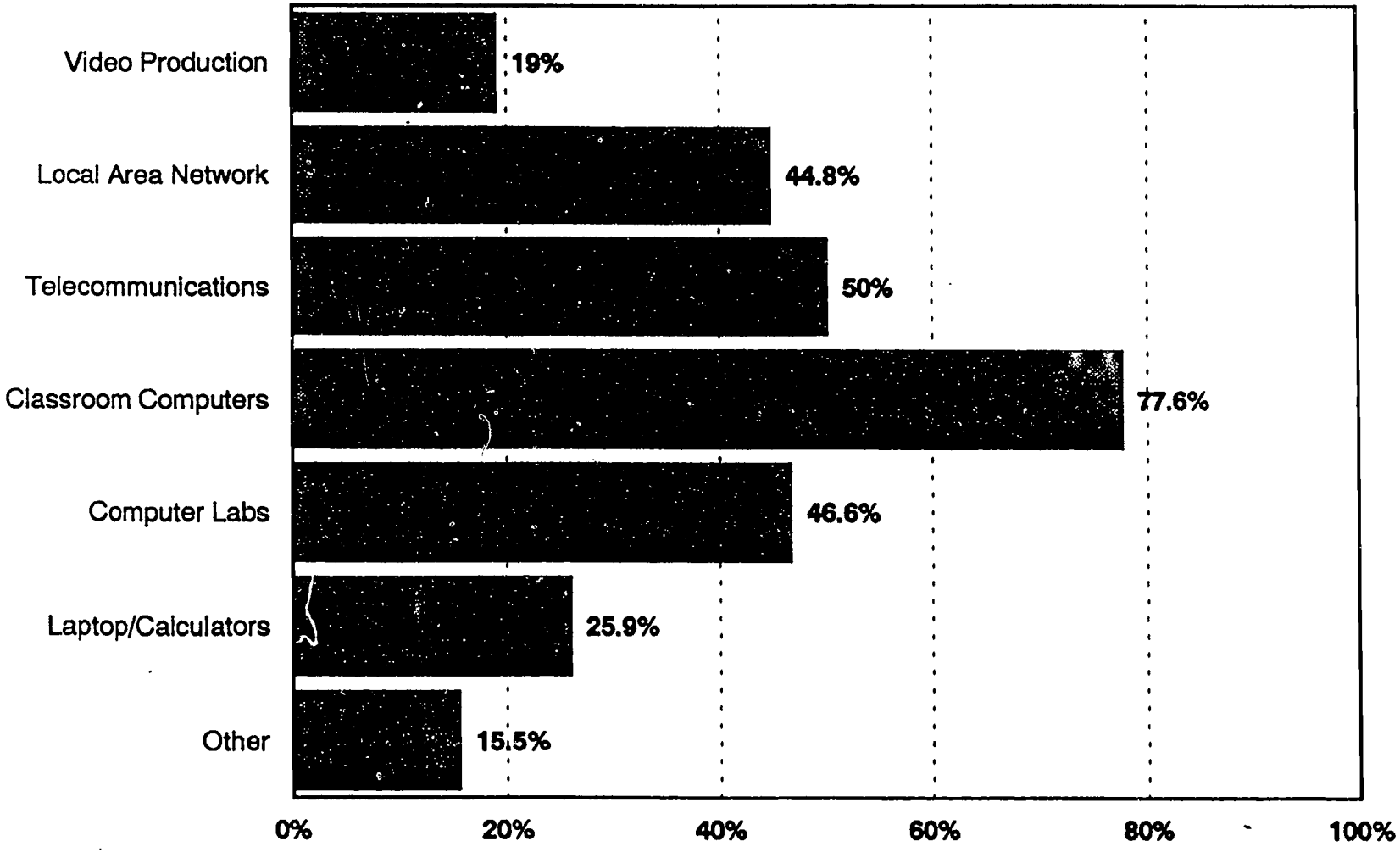

Figure 3

Factors Inhibiting and Facilitating Dissemination (N=62)

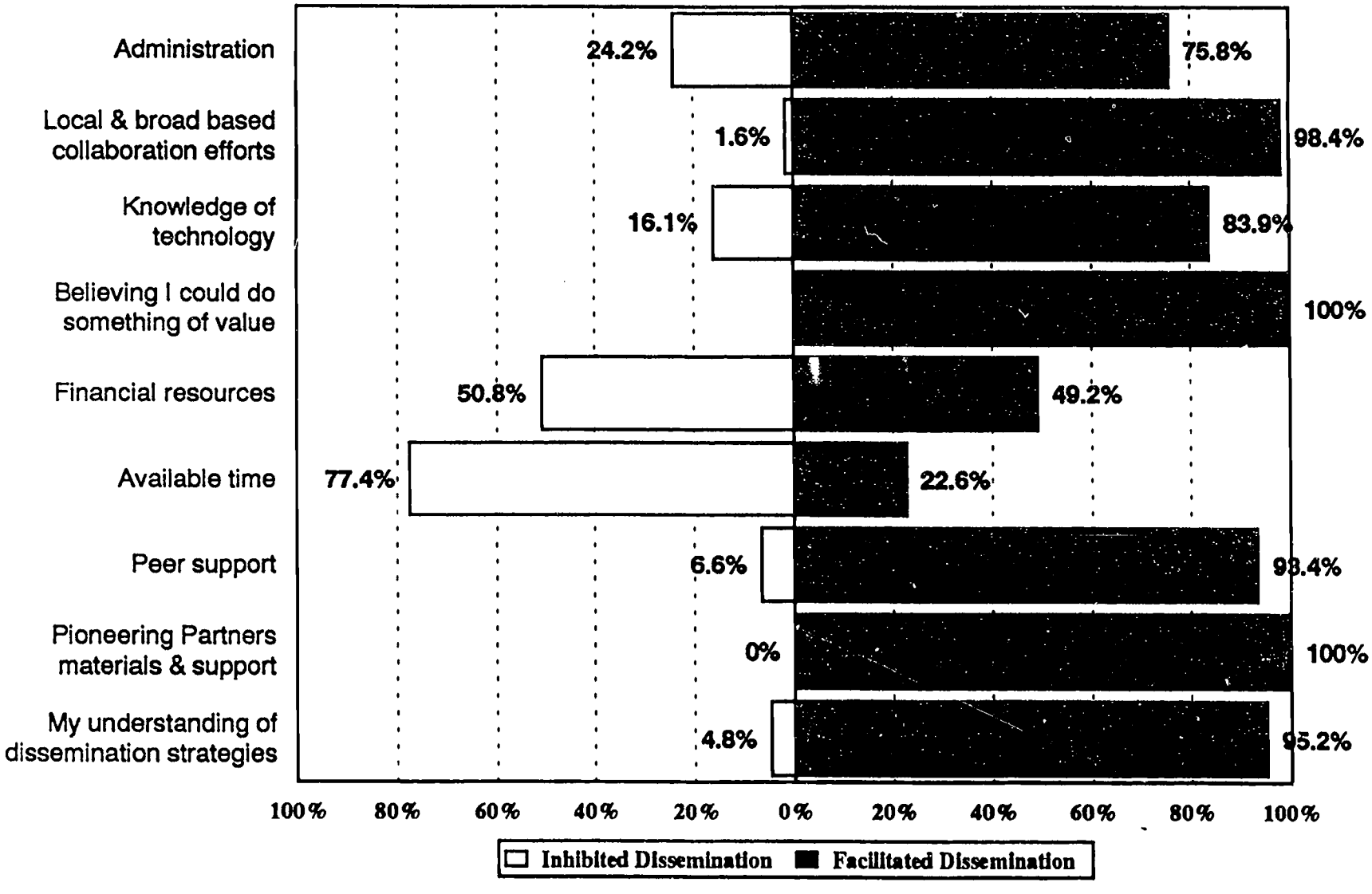

Figure 4

Conditions Prompting the Implementation of Technologies at Disseminating and Adopting Locations (N=64)

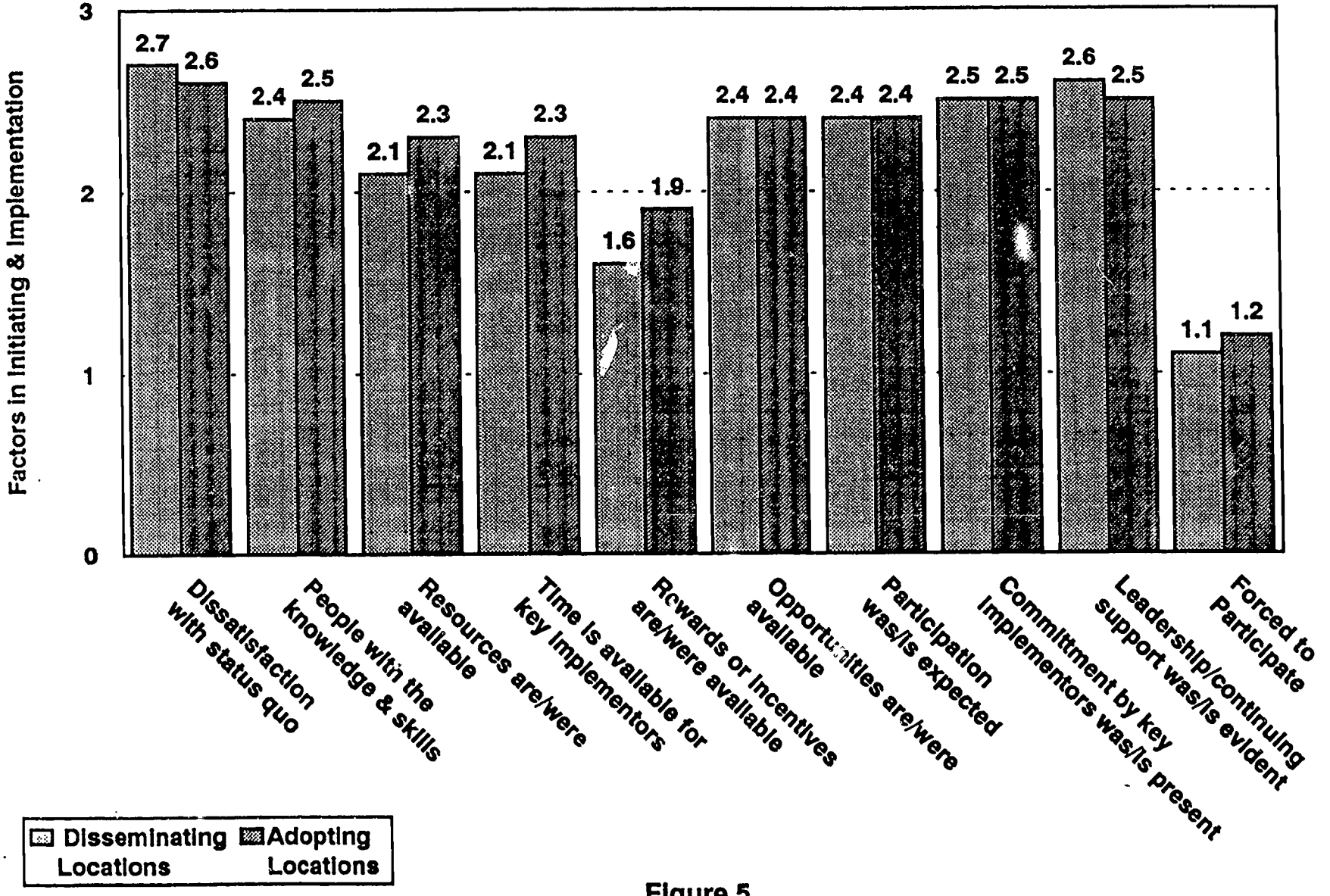

Figure 5

Levels of Use Chart

Scale Point Definitions of the Levels of Use	Categories						
	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing
Non-Use							
Orientation							
Preparation							
Mechanical Use							
Routine							
Refinement							
Integration							
Renewal							

Table 1

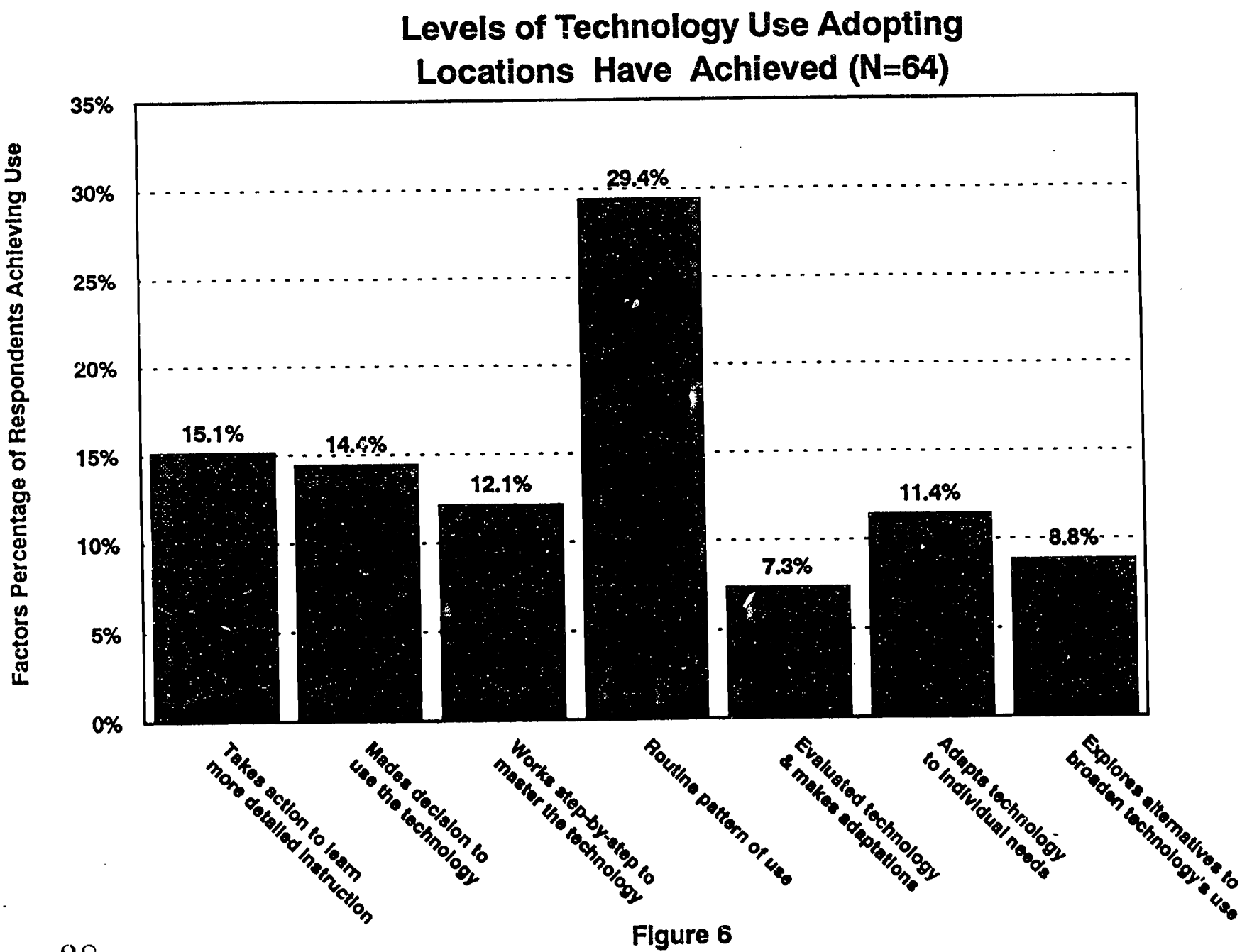
Levels of Technology Use Adopting Locations Have Achieved (N=64)
Factors Percentage of Respondents Achieving Use
35%
30%
25%
20%
15%
10%
5%
0%
15.1%
14.4%
12.1%
29.4%
7.3%
11.4%
8.8%
Takes action to learn more detailed instruction
Makes decision to use the technology
Works step-by-step to master the technology
Routine pattern of use
Evaluates technology & makes adaptations
Adapts technology to individual needs
Explores alternatives to broaden technology's use

Figure 6

Categories of Educational Technology Activity at Adopting Locations

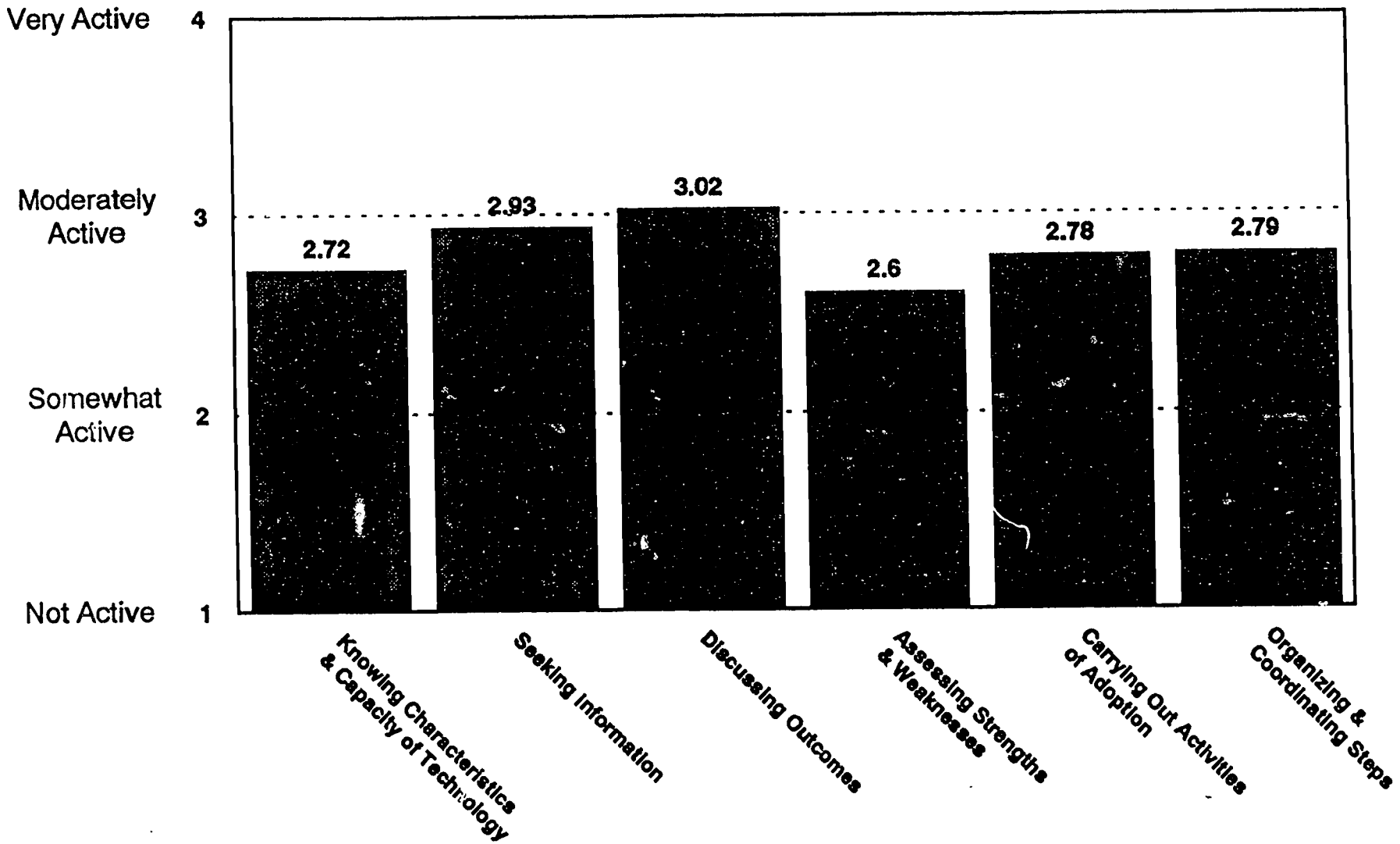

Figure 7

Allocation of Time to Activities of Dissemination (N=62)

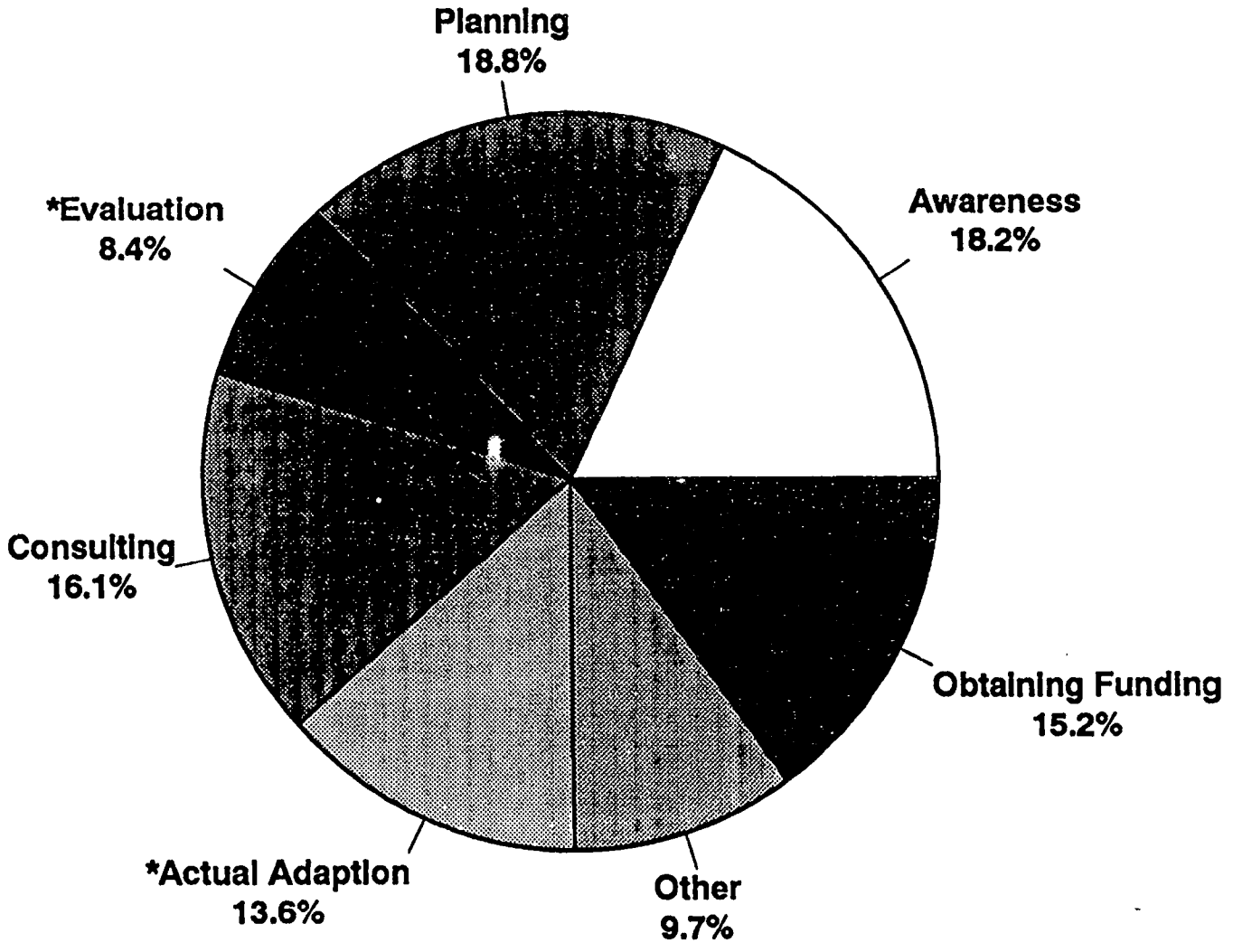

Figure 8